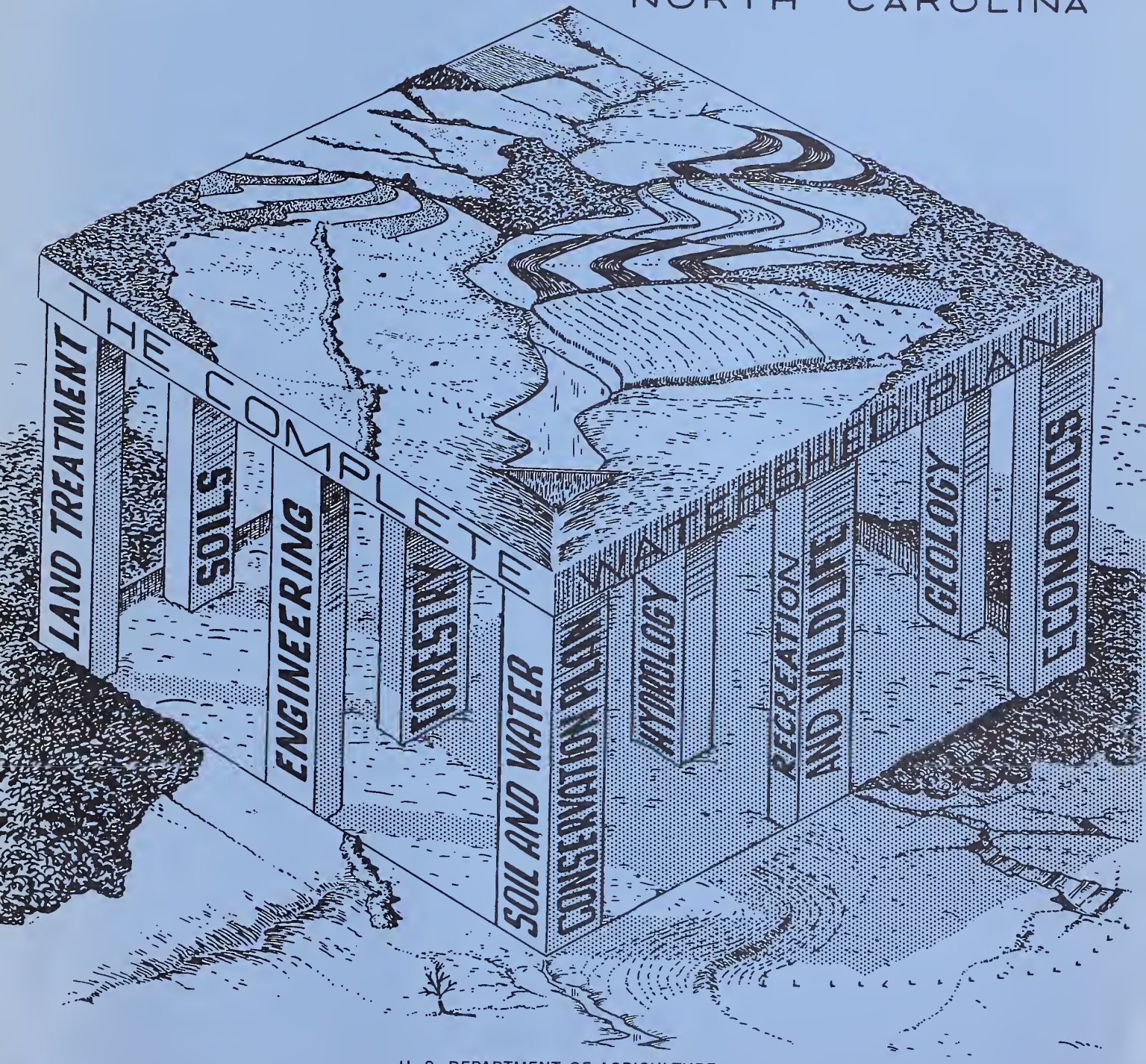
TCHMAN CREEK Watershed Work Plan

DAVIE, YADKIN AND IREDELL COUNTIES
NORTH CAROLINA



U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

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WATERSHED WORK PLAN

DUTCHMAN CREEK WATERSHED

Davie, Yadkin and Iredell Counties, North Carolina

Prepared Under the Authority of the Watershed Protection and Flood Prevention Act (Public Law 566, 83d Congress, 68 Stat. 666), as amended.

Prepared by: Davie Soil and Water Conservation District

Yadkin Soil and Water Conservation District

Iredell Soil and Water Conservation District

Davie County Board of Commissioners

Dutchman Creek Watershed Improvement District

With assistance by:

U. S. Department of Agriculture, Soil Conservation Service

U. S. Department of Agriculture, Forest Service

MAY 1964

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SUMMARY OF PLAN

The watershed is located in Davie, Iredell and Yadkin Counties and has a drainage area of 81,500 acres.

Sponsors of the project are: (1) Davie Soil and Water Conservation District, (2) Iredell Soil and Water Conservation District, (3) Yadkin Soil and Water Conservation District, (4) Davie County Board of Commissioners, and (5) Dutchman Creek Watershed Improvement District.

The watershed is a gently rolling plateau that breaks sharply along the streams. Soils are Cecil, Lloyd, Enon, Iredell, Wilkes, and Mecklenburg. About 21 percent of the watershed is in cropland, 48 percent woodland, 18 percent grassland, and 13 percent miscellaneous. Climatic conditions are excellent for agricultural purposes.

There are about 775 farms within the watershed. The average value as shown in the 1959 U. S. Agricultural Census is $15,705. About 7,000 people live in the watershed; 2,600 on farms, 2,200 rural non-farms, and 2,200 in towns and villages.

Four hundred thirty-six of the farmers are soil and water conservation district cooperators.

Damaging floods have occurred 67 times in the 25-year evaluation period. The largest storm occurred on September 17, 1945 and damaged about 4,280 acres of flood plain land. Floodwater damage to public roads, bridges, homes, fences, and other fixed improvements is in excess of $20,000 annually. Agricultural uses of the flood plain are now limited to pasture and low income crops.

Sediment damages 156 acres of crop and pasture land annually. Flood plain scour has reduced yields 20 to 40 percent on 68 acres. Sheet erosion has removed about 50 percent of the topsoil from the open lands of the watershed.

The plan was formulated to meet the following objectives agreed to by the sponsoring local organizations which are: (1) improvement of on-farm conservation land treatment measures and practices, (2) reduction in area, frequency, depth, and duration of flooding so that flood plain lands can be used economically for agricultural purposes, and (3) reduce sediment damages from infertile deposition and swamping.

The land treatment objectives will be attained by treating 5,947 acres of cropland, 3,577 acres of grassland, 3,871 acres of woodland, 42 acres of roadsides, and 65 acres of critically eroding areas. The land treatment measures will give needed protection from erosion to the upland.

The floodwater and sediment damage reduction objectives will be attained by constructing nine floodwater retarding dams, 204,587 feet of stream channel improvement, and 181,600 feet of stream clearing and snagging. Structural measures will give a minimum of two-year flood protection to flood plain land below dams. Clearing and snagging will give about one-year protection from flooding to those areas where this improvement is made.

The works of improvement included in the work plan are scheduled for a five-year installation period.

The total cost of the project is estimated to be $2,266,838. Planned land treatment measures to be installed will cost about $585,771. Of this amount, P. L. 566 will pay $136,299 for accelerated technical assistance and $16,315 in cost-sharing for critical area plantings and cooperative fire control. Local and non-Federal funds will pay $394,975 as their share of the installation cost of these measures. Going programs will pay $38,182.

Structural measures to be installed will cost an estimated $1,681,067. The P. L. 566 cost of these measures is about $1,429,843 for construction and engineering services. Local and non-Federal costs are estimated to be $251,224 for land, easements and rights-of-way, and administration of contracts.

Water level control devices will be installed in the risers of all dams to mitigate damages to fish and wildlife. The total cost of this measure is about $4,890. P. L. 566 funds will pay this cost.

The Dutchman Creek Watershed Improvement District has been organized by referendum with power of assessment and eminent domain. This organization will secure land, easements and rights-of-way, and administer contracts. Funds for these purposes will be obtained by assessment.

Land treatment measures will be maintained by landowners or operators. The soil and water conservation districts will encourage the maintenance of these measures and will furnish technical assistance where needed.

Structural measures will be operated and maintained by the Dutchman Creek Watershed Improvement District at an estimated annual cost of $22,010. These funds will be obtained by assessment on benefited land. An inspection will be made of the structural measures at least once a year and/or after each major storm event.

The average annual cost of the project, including operation and maintenance, is estimated at $78,843.

The installation of the project will yield $133,463 flood prevention benefits, $20,509 secondary benefits, and $3,600 incidental recreational benefits, for a total of $157,572. This gives a benefit-cost ratio of 2.0 to 1.0.

A private landowner plans to increase the storage capacity of the permanent pool of dam No. 15. The lake will be developed for private income-producing recreation. The sponsoring local organizations concur in this development.

The project will benefit about 4,280 acres of flood plain land within the watershed and a minimum of 605 acres on the Yadkin River. Sediment delivered to High Rock Lake will be reduced by 92 acre-feet annually.

DESCRIPTION OF THE WATERSHED

Physical Data

The Dutchman Creek Watershed, consisting of 81,500 acres, is located in Davie, Iredell, and Yadkin Counties, North Carolina. The stream originates in the northwest corner of Davie County and flows southeasterly to its confluence with the Yadkin River at the Davidson County line.

The principal upland soils are members of the Cecil, Lloyd, Enon, Iredell, Mecklenburg, Wilkes, and Davidson series along with smaller amounts of the Mayodan, Wadesboro, and Appling series. The soils are developed from a wide variety of rocks. They are usually 36 inches or more deep on the smoother areas and shallower on the areas of steeper topography. Flood plain soils are members of the Chewacla, Wedhadkee, and Alluvial soils undifferentiated (poorly drained) series. These soils are in capability classes IIIw and IVw.

Approximately 21 percent of the watershed is in cropland, 48 percent is woodland, 18 percent is grassland, and 13 percent is idle and miscellaneous. Cover conditions are fair to good. The climate of the watershed is excellent for agricultural purposes. Temperatures vary from extremes of 104 degrees Fahrenheit in summer to a low of minus three degrees Fahrenheit in winter. The January average is 43 degrees Fahrenheit and the July average is 78 degrees. The normal growing season extends from April 7 to November 5, which is 210 days. Rainfall is well distributed throughout the year and averages approximately 46 inches.

The surface of the area is a gently rolling plateau that breaks sharply near the valleys. Steep rolling areas are small and generally parallel the stream courses. Elevation ranges from 630 feet in the flood plain at the confluence of Dutchman Creek and the Yadkin River to nearly 900 feet at the western end of the watershed. The flood plain is flat and most of the stream channels are partially blocked with sediment and debris. This condition causes flooding of large areas of the flood plain during the larger storms.

The North Carolina Wildlife Resources Commission, Fish Division, made a survey of the Dutchman Creek as a part of the total study of the Yadkin River Watershed. Their findings were published in "Survey and Classification of the Yadkin River and Tributaries, North Carolina." This publication assigns to this stream the ecological classification of "Largemouth bass type stream." It further states that "It is borderline water at best." The Appendices state that "The stream has much bank fishing in deep holes for catfish." It lists the following game and non-game fish as being present:

Game	Non-game
Green sunfish	White catfish
Bluegill	Brown bullhead
Redbreasted sunfish	Whitefin shiner
White perch	Bluehead chub
White crappie	Margined madtom
Yellow perch	Moxostoma species
Largemouth bass	

Most of these fish are found in the deep, still pools near the lower end of the watershed. They feed on aquatic insects, crustaceans, and small fish.

The quality of fishing in this stream was not characterized in the report. Local game protectors, however, report that Dutchman Creek and Cedar Creek afford a tremendous amount of fishing.

To a limited extent,ducks utilize this stream as a wintering area and a breeding ground. The wood duck nests in hollow trees during the spring and summer. Mallards, black ducks, and wood ducks find shelter on the quiet pools during the winter months. Food is found in the stream and adjacent farmland.

Other species of wildlife in the area are rabbit, raccoon, squirrel, opossum, bobwhite quail, and dove. Furbearers present are mink, muskrat, and fox.

Economic Data

Lands of the watershed have been used for a rather well-balanced agriculture since the land was settled. In recent years, livestock for milk and beef has increased and row crops have decreased. Small amounts of cotton and tobacco are produced. Most of the cropland is used for pasture, hay, small grain, and corn,with about half of the corn used for silage.

There are about 775 farms within the watershed. These farms vary in size from ten to 500 acres, with the average size being 109 acres. According to the 1959 U. S. Agricultural Census, the average value of a farm is $15,705. The population of the watershed is approximately 7,000, of which 2,600 live on farms, 2,200 live in town, and 2,200 in rural non-farm areas.

The area is well served by the Southern Railway and good highways. U. S. Highways Nos. 64, 158, and 601; and North Carolina Highway No. 801 cross the watershed. There is a good network of farm-to-market roads. Mocksville is the supply center and Winston-Salem and Salisbury are the shopping centers for the people of the watershed.

Four hundred eighteen farmers have developed complete soil and water conservation plans on 46,779 acres. Eighteen additional farmers have signed cooperative agreements on 1,538 acres.

WATERSHED PROBLEMS

Floodwater Damage

Sixty-seven storms caused flooding during the 25-year evaluation period. Thirty-one of these storms occurred during the growing season. The largest storm in the series occurred on September 17, 1945 and flooded about 4,280 acres.

Public roads, bridges, and other public improvements in the watershed are being damaged by floodwater at the average of $3,500 per year. Floodwater damages to private homes, roads, bridges, fences, and buildings exceed $20,000 annually.

Dairy and beef animals have drowned and the farmers have endangered their health and lives by trying to get the livestock to higher ground during periods of flooding.

Landowners state that crops and pasture yields are being severely reduced due to the floodwater damage. Dairymen and livestock producers are forced to grow corn silage and other feed crops on erosive upland in order to produce enough feed for their animals. Even though they might make as high or higher yields in the flood plain, they cannot risk the loss of a silage crop since silage

is not bought and sold on the open market.

In spite of the fact that the flood hazard depresses land values, the average value of flood plain land is $300 per acre. Other land ranges in value from $100 to $500 an acre.

Sediment Damage

Sand is being deposited on about 156 acres of crop and pasture land annually.

These acres are yielding about 20 percent less than other acres flooded.

Sections of the channel have been filled with sediment and 416 acres of flood plain land have been damaged about 50 percent by swamping. Natural levees have built up in some locations and have added to the swamping and drainage problems. Channel fill is more than six feet deep in many places.

The most frequently flooded areas are subject to heavy sediment damages and are more often found in the lower part of the watershed. These acres are either idle or in low quality pasture. Farmers and landowners cannot economically reclaim or use this land more intensively until floodwater and sediment damages have been reduced. The average annual sediment yield at the mouth of the watershed is estimated to be 202,000 tons. Most of this is delivered into High Rock Lake, causing an annual loss of an estimated 143 acre-feet of water storage.

Erosion Damage

Sixty-eight acres of land have been damaged by flood plain scour. Investigations show that yields on these acres range from 20 to 40 percent lower than on the undamaged acres.

It is estimated that 50 percent or more of the topsoil on the open upland soils have been removed by past sheet erosion. In recent years, due to an increase in good conservation farming, sheet erosion has been decreased. An accelerated conservation program during the life of the project will decrease sheet erosion as much as 65 percent on crop and pasture land. This reduction in erosion, along with the structural program, will decrease sediment damages resulting from sheet erosion to a near minimum.

The woodland cover, except for a few small areas, is fair. It is less than satisfactory in its hydrologic effectiveness in reducing storm runoff.

Gully erosion never has been very active in Dutchman Creek Watershed. Untreated roadbanks are a source of some sediment.

Problems Relating to Water Management

Nearly all of the flood plain land will benefit from improved drainage. This drainage can be installed after the structural works of improvement have been completed. Channel capacities are adequate for drainage except for those reaches that have been filled with sediment. Channel fill is more than six feet deep in some places, and drainage outlets for large areas of flood plain land have been blocked.

Existing private and public recreation facilities are overcrowded by the 400,000 people in the commuting areas.

Since the watershed is almost surrounded by highly industrialized centers, there is a definite need for additional water based recreational facilities.

PROJECTS OF OTHER AGENCIES

The U. S. Army, Corps of Engineers, recommended a plan for improvement of the Yadkin River as indicated in House Document No. 652, 78th Congress, 2nd Session. In 1962, a flood control dam was completed on the Yadkin River near North Wilkesboro. Further works of improvement on the Yadkin River have not been approved. The Dutchman Creek Watershed Work Plan has been developed to give flood protection to an area not protected by the Yadkin River Plan of 1944.

The North Carolina Division of Forestry, in cooperation with the U. S. Forest Service, furnishes fire protection to Iredell and Yadkin Counties of the watershed area. Davie County has no State fire protection for private woodlands at present. The Davie County Board of Commissioners has indicated to State forestry officials that they would sign a cooperative agreement with the North Carolina Division of Forestry when the watershed project is activated. This agreement would provide fire protection and a permanent forestry organization in the county. Cooperative fire protection by the North Carolina Division of Forestry is furnished under Section 2 of the Clarke-McNary Act.

The private woodland owners in Iredell and Yadkin Counties are furnished technical forestry assistance by the North Carolina Division of Forestry, in cooperation with the U. S. Forest Service. Lack of State fire protection and a permanent county forestry organization has made this technical assistance unavailable to landowners in Davie County. With the activation of the County Forester Organization, the necessary facilities for forest management assistance will be available in Davie County and in the entire watershed. This type of forest management assistance is furnished through the Cooperative Forest Management Act.

The North Carolina Extension Service, the Soil and Water Conservation Districts, and the Agricultural Stabilization Conservation Service are conducting regular "going" programs within the watershed.

BASIS FOR PROJECT FORMULATION

Project formulation was based on objectives of the sponsoring local organizations and agreed upon by the Soil Conservation Service. These objectives include (1) significant improvement in on-farm conservation land treatment programs, (2) reduction in area, frequency, depth and duration of flooding so that flood plain lands can be used economically for agricultural purposes, and (3) reduction to a practical minimum of sediment damages from infertile deposition and swamping.

Land treatment measures included in this plan were selected on the basis that (1) they will effectively reduce floodwater, sediment and erosion damages, and (2) will increase efficiency of farm operations.

Structural works of improvement were selected to meet the objectives of the sponsoring local organizations, physical characteristics of the watershed, and Soil Conservation Service criteria. Floodwater retarding structures were selected to protect the maximum flood plain area at the minimum cost. Stream channel improvement was planned to add to the protection provided by floodwater retarding structures and give protection to areas where floodwater retarding structures are not planned. The effects of the structural measures were analyzed which show that the problems of the watershed will be materially reduced. This is in consideration of the resources and desires of the sponsoring local organizations and the Federal assistance that is authorized under the Act.

Stream channel improvement will destroy some bank vegetation, holes, undercut banks and log jams which furnish places for fish to hide and feed. It will also destroy nesting places and protective cover for wintering waterfowl.

Wildlife investigations were made jointly by Biologists from the North Carolina Wildlife Resources Commission, U. S. Fish and Wildlife Service, and the Soil Conservation Service. These investigations were made to determine the potential damages to fish and wildlife caused by the project. Ways of mitigating these damages were recommended.

The sponsoring local organizations have fully explored the opportunities for public recreational development of floodwater retarding structures. They have reached the conclusion that it is not feasible for them to develop recreational facilities at this time.

WORKS OF IMPROVEMENT TO BE INSTALLED

Land Treatment

Flood prevention and soil and water conservation are primary objectives of this plan. In order to reach these objectives, a land treatment program that will reduce runoff and erosion must be planned and applied. The land treatment program outlined in the following paragraphs is considered a basic element of the overall plan.

The watershed is in an area of gently rolling topography. Row cropping of the long gentle slopes causes a high rate of runoff and creates a serious erosion hazard. Runoff and erosion are problems on some land being used for hay and pasture.

About 17,000 acres (approximately 21 percent) of the land in the watershed are being used for growing row crops and 15,000 acres (approximately 18 percent) are being used for hay and pasture. No significant changes in the acreages of different land uses are expected to occur during the operations period of this project. About 40 percent of the land is used for growing row crops and grass; therefore, planning and applying a land treatment program is a major job in this project.

In developing the land treatment program, the physical condition and features of the land as well as the major types of farming, availability of equipment, economic resources, etc., were carefully considered. Conservation practices were then selected that will provide landowners with alternative measures or combinations of measures with which to develop farm conservation plans consistent with their individual problems and desires. These alternates will also include those that directly benefit wildlife resources.

To control runoff and erosion and improve drainage on cropland, the best possible combination of mechanical practices such as mains and laterals, diversions, terraces, contour farming, stripcropping, and grassed waterways will be used along with vegetative practices, e.g., conservation cropping systems, cover crops, crop residue use, and field border planting.

Good grass and legume covers will be maintained, and grass and legume covers which are not satisfactory will be renovated. New pasture or hay will be planted on steeper land suited for grass. The total grassland program will be planned to provide good quality forage in adequate amounts. This will naturally reduce runoff, erosion, and flooding.

The planning and application of the land treatment program will result in 70 to 75 percent of all cropland and grassland in the watershed being properly treated during project operations. To accomplish this objective, it will be

necessary to treat 5,947 acres of cropland and 3,577 acres of grassland. This will be in addition to land already properly treated.

Good conservation planning will result in a good land treatment program. Four hundred thirty-six of the 775 farms in the watershed are district cooperators. To insure the attainment of land treatment objectives in this watershed, the Board of Soil and Water Conservation District Supervisors expect 181 additional landowners who control 19,772 acres of land to sign agreements to become new cooperators with the local Soil and Water Conservation District. One hundred forty-six landowners controlling 16,357 acres of land will develop new complete soil and water conservation farm plans. One hundred twenty-one old soil and water conservation farm plans covering 12,988 acres will be revised and brought up-to-date.

The planning and application of an effective land treatment program is one of the basic elements necessary for the attainment of project objectives and the continued successful functioning of structural measures. Therefore, at least 40 percent of the farms in the subwatershed above any structure or construction unit will have developed complete soil and water conservation plans before any construction begins. In addition, a minimum of 20 percent of the needed land treatment on crop and grassland will be applied before any construction begins. Meeting this minimum level of land treatment in advance of the structural program will help insure the successful functioning of the overall project.

Forty-two acres of roadsides will be vegetated to minimize erosion. Forty-six acres of open land will be vegetated with grasses and legumes to stabilize critical silt producing areas. Basic plans for land on which at least 75 percent of these areas are located must be prepared prior to the execution of a project agreement for construction of works of improvement. These plans must schedule the installation of these measures either before or concurrently with installation of the structural measures covered by each project agreement.

Forest Land

Foresters designed the land treatment measures to stabilize and protect the soil and speed recovery of deteriorated soils. The leaves and needles of certain tree species are good builders and protectors of the forest humus and soil. The land treatment measures will favor these species. A good protective canopy of these trees over a thick porous layer of organic material at the soil surface increases the water absorption and provides more food and cover for wildlife. Well-developed forest soils rapidly absorb storm rainfall, retard runoff, promote orderly stream flow, and produce more wood products and game food. Landowners will install measures for watershed protection on 3,871 acres.

Cooperative fire protection is essential to a sound forestry program. The North Carolina Division of Forestry will erect a 100-foot fire lookout tower on a suitable location in Davie County. They will also provide miscellaneous items of fire control equipment for the Davie Suppression Forces.

The State will furnish trained personnel to operate the fire control organization in Davie County. State and P.L. 566 funds will share equally the cost of the fire control equipment.

Critical Area Planting

The watershed sponsors, with the cooperation of private landowners and the assistance of the North Carolina Division of Forestry, will plant trees on 19 acres of critically eroding open land. The sponsors will install fencing and site preparation measures where necessary for the success of the treatment. Needed fencing should be installed prior to planting or site preparation work. Site preparation measures such as brush dams and planting suitable grasses and legumes should be installed at least one growing season before trees are planted.

Structural Measures

Floodwater retarding structures are planned for nine locations and are shown on the watershed project map. Each structure will be an earthfill dam with a fixed drawdown tube and a vegetated emergency spillway. A reinforced concrete riser will fix the elevation of the sediment pool. A metal slide headgate will be located near the bottom of the riser so that the sediment pool can be drained. All embankments, earth spillways, borrow areas, and other areas disturbed in construction will be vegetated. Design data for these structures are shown in Table 3. A typical cross section of a floodwater retarding structure is shown in the Investigations and Analyses section of this plan.

The structures provide 9,721 acre-feet of floodwater detention and control 43.1 percent of the entire area of the watershed. The floodwater detention capacity is 3.32 inches of runoff from the drainage area of the structures, or 1.43 inches of runoff from the entire watershed. These structures are also designed to store 1,551 acre-feet of sediment, which is the yield for 50 years.

The landowner on whose land floodwater retarding structure No. 15 is located plans to increase the permanent pool from 44 to 90 surface-acres. This will require 247 acre-feet of additional storage. The additional water is to be used for private income-producing recreation. A non-project cost of about $16,600 will be paid by the landowner for this additional storage.

The estimated cost of installing the floodwater retarding structures is $767,030 (Table 2).

Measures to mitigate fish and wildlife damages included in the project are water level control devices in the risers of all floodwater retarding structures. It consists of a downward opening slide gate covering an opening in the side of the riser. This measure will make possible fluctuation of the water level so that the impoundment areas can be managed for duck and fish. The P. L. 566 cost of this measure is estimated to be $4,890.

Channel improvement is planned for about 386,200 feet. It will consist of approximately 204,600 feet of stream channel enlargement and realignment on the main stem and Cedar Creek. Clearing and snagging will be performed on 181,600 feet of tributary channels. The removal of drifts and islands will be included in the clearing and snagging (see project map for locations). The total estimated installation cost of the channel improvement is $914,037 (Table 2).

The main stream channels, which are planned for enlargement, were designed to remove within 24 hours the runoff from a typical 3.5 inches, 24-hour storm. This is equal to protection from a storm of about two-year frequency. Clearing and snagging will provide somewhat less protection.

Most of the tributary channels will be improved in the flood plain area of the main stream. Local inflow will be delivered through on-farm drainage ditches to the tributary channels or constructed spur inlets, thence safely into the main stream.

The average annual cost of structural works of improvement, including operation and maintenance, is $78,843. A breakdown of measures, quantities and distribution of installation costs between P. L. 566 and other funds for the project is shown on Table 1.

EXPLANATION OF INSTALLATION COSTS

The estimated installation cost of the project is $2,266,838, of which $1,582,457, or 69.8 percent, will be P. L. 566 funds and $684,381, or 30.2 percent, will be other funds. The schedule of estimated installation cost by project years is shown at the last of this portion of the narrative.

The total estimated installation cost of all land treatment measures is $585,771; $152,614 from P. L. 566 funds and $433,157 from other funds. These estimated installation costs include labor, machinery, materials and all direct and indirect costs related to these measures. These services in kind will equal or exceed the local cost sharing shown in the tables.

Land treatment, other than forestry measures, will cost an estimated $511,411. Of this amount, other funds will be $343,160 for labor, materials and equipment.

The P. L. 46 District Programs will pay $32,037 for technical assistance. P. L. 566 funds will pay $129,314 for accelerated technical assistance and $6,900 for cost sharing of critical area stabilization.

The cost of forest land treatment measures is $74,360. Of this amount, $16,400 is P. L. 566 funds and $57,960 is other funds. The North Carolina Division of Forestry will furnish $9,640 of State funds as part of other funds. This State money will be used to match P. L. 566 funds in the purchase of cooperative fire suppression equipment.

This plan accelerates technical forestry assistance for private land at a cost of $13,130; $6,985 in P. L. 566 funds, and $6,145 in State funds.

The total cost of structural works of improvement is estimated at $1,681,067. Land, easements and rights-of-way costs are estimated at $245,224. The administration of contracts will cost about $6,000. These two items of cost will be furnished by the Dutchman Creek Watershed Improvement District. P. L. 566 costs will amount to $1,429,843. Contract costs will amount to $1,114,998; engineering services, $227,576; and other costs, $87,269. Included in the above costs are 12 percent for contingencies.

The sum of $4,890 is included in the cost of floodwater retarding structures to mitigate fish and wildlife damages caused by the project.

A local landowner desires to store additional water in dam No. 15 for private income-producing recreational development. The total non-project cost of this storage is about $16,600. Land valued at $2,659 will be furnished in kind. The remaining cost is the prorata part of the construction cost allocated by the "use of facilities" method to the extra water.

Schedule of Estimated Installation Costs

The following summarizes the construction schedule and the estimated installation costs:

Year	P.L. 566 Funds	Other Funds	Total Funds
First	30,000	85,000	115,000
Second	200,160	149,660	349,820
Third	195,000	113,400	308,400
Fourth	290,300	175,700	466,000
Fifth	866,997	160,621	1,027,618
Total	1,582,457	684,381	2,266,838

EFFECTS OF WORKS OF IMPROVEMENT

The proposed land treatment and structural program will benefit about 4,280 acres of flood plain land within the watershed and a minimum of 605 acres of flood plain just below the project along the Yadkin River. Benefits to flood plain land outside the watershed were not evaluated. It will reduce sedimentation to High Rock Lake on the Yadkin River 10 miles below the watershed, 92 acre-feet annually.

The installation of forest fire protection in Davie County will benefit the Cooperative Forest Management Program on most of the watershed.

Structures will provide two-year protection along the main stem and lower reaches of Cedar Creek. Clearing and snagging of channels will provide about one-year protection on the remaining tributaries. The project will eliminate flooding from 51 of the 67 storms in the 25-year evaluation series for the area below the floodwater retarding structures. The area flooded by the two- and five-year storms will be reduced 86.4 percent and 60.4 percent respectively. There will also be a significant reduction in the size of the remaining floods.

The project will reduce the annual sediment delivered to High Rock Lake by 123,000 tons. Land treatment will account for 88,000 tons and floodwater retarding structures, 35,000 tons.

There will be no increase in the acreage of cropland in the watershed. Needed land use adjustments will be made so that land can be used according to its capabilities and treated according to its needs. This will be possible when 2,706 acres of flood plain can be restored to its former productivity, or used more intensively. Future land use in the watershed is expected to be 15,974 acres of cropland, 15,546 acres of grassland, 39,749 acres of woodland, and 10,231 acres of miscellaneous land.

The lakes created by the 273 surface-acres of eight sediment pools and 90 surface-acres of recreational water behind dam No. 15 will provide facilities for picnicking, swimming, fishing, water skiing, and boating. There will be roads to all nine sites, giving easy access. Sponsors and landowners have stated that organized groups and the general public will be encouraged to make maximum use of the recreational facilities.

Each structure will have a riser with a water level control device. The lakes will be stocked with fingerling bass and bluegills, at the proper ratio to provide sport fishing. This stocking will be done by the U. S. Fish and Wildlife Service, Bureau of Sport Fisheries.

The water level control devices included as mitigation measures in the work plan may be used when needed to lower the water level in the sediment pools during the summer months. Four types of benefits will probably accrue from this action:

(1) Choice duck foods can be grown over portions of the area while the water is down. Raising the water in the fall will make satisfactory feeding grounds for the ducks.

(2) The fish can be concentrated during the summer months. Small forage fish will be easier caught by the larger fish. This will maintain a better population balance. The forage fish will grow larger because more food will be available to the individuals remaining.

(3) The forage fish will have access to all of the reservoir during the seasons of their most vigorous growth -- fall, winter and spring.

(4) Some aquatic weeds will be controlled.

Six cities and towns, with a combined population of 250,000, and 150,000 non-urban people (total of 400,000) are within easy driving distance of the recreational facilities. With planned facilities and proper maintenance at each site, 3,600 user-days a year is a conservative estimate for the eight sites on which incidental recreation benefits are claimed. One landowner has requested and received permission from the sponsors and the Service to add 46 surface-acres of water, at his expense, to a floodwater retarding impoundment in order to have a 90-acre lake as part of a planned income-producing recreational facility. It will accommodate 4,000 user-days annually, and give an annual benefit of $6,000. This benefit was not used for project justification.

Secondary benefits from a national viewpoint were not considered pertinent to the evaluation. Local secondary benefits will accrue as a result of increases in the sale of agricultural products and increased income to local processors, business establishments, and others not directly benefited. These local secondary benefits also include the transporting, processing, and marketing of those goods and services that produce the primary benefits, and the supply of additional materials and services required to make possible the increased net returns which stem from installation of the project.

Crop and pasture damage will be reduced by 85 percent, minor and major fixed improvements damage by 86 percent, and indirect damage by 85 percent. Farm ponds will receive less sediment and stay clearer which will produce better fishing and higher productivity.

About 800 people in 200 rural families with flood plain land, will receive direct benefits by the structural program. The acreage of flood plain benefited on the individual pieces of property ranges in size from one to 100 acres.

Seven thousand people in the watershed will receive some type of benefit. The income of the flood plain farmer will be increased. The overall economy of the entire watershed will be greatly enhanced by the project through better land use, reduction in farming costs, and providing jobs.

The reduction in the frequency, duration and magnitude of the flooding will: (1) permit needed land use adjustments to be made, (2) enable farmers to use the productive flood plain more intensively, (3) greatly reduce the extent of present crop and pasture damages, (4) reduce sediment and scour damages, (5) permit essentially uninterrupted travel throughout the watershed, and reduce the amount of maintenance work to roads, bridges, and minor fixed improvements.

Installation of planned works of improvement will accomplish the stated objectives of the sponsoring local organizations.

PROJECT BENEFITS

The average annual floodwater damage to crops, pasture, and minor and major fixed improvements is estimated to be $93,487. The installation of the planned works of improvement will reduce these damages to an estimated $14,369 annually. Estimated benefits from flood damage reduction amounts to $79,118 (Table 5), or an 85 percent reduction in damages. These benefits consist of reductions in crop and pasture damage amounting to $35,093, of which $12,450 is restoration to former productivity; minor and major fixed improvements, $20,319; sediment and erosion, $16,513; and indirect damage, $7,193.

Estimated total average annual benefits from installation of the structural works of improvement amount to $157,572 (Table 6). These consist of flood damage reduction benefits, $71,081; more intensive land use benefits, $62,382; secondary benefits, $20,509; and incidental recreational benefits, $3,600.

In addition, it is estimated that land treatment measures will provide flood damage reduction benefits of $8,037 annually. It is expected that land use changes will be made on uplands so that it will be used according to its capability class. Under the program, forest land will probably remain near the present acreage. The overall level of productivity of cropland, grassland, and forest land will increase with the higher level of management made possible with the project.

The establishment of full tree cover on open areas of heavy, active erosion will largely eliminate the damaging surface runoff and sediment loads which originate on such areas. Installation of the hydrologic stand improvement measures prescribed in the work plan and protection of the treated areas will decrease damaging storm runoff from forest areas. These areas will also function as demonstrations of effective watershed management to landowners in the watershed. Under good management, forest lands of the watershed will produce an average merchantable volume two to four times greater than at present. The total forest land area, 39,749 acres, will remain the same under the watershed program.

COMPARISON OF BENEFITS AND COSTS

The average annual flood prevention benefits from the structural measures are estimated to be $133,463 primary benefits, $20,509 secondary benefits, and $3,600 incidental recreation benefits, for a total of $157,572. The average annual cost, including $13,500 for operation and maintenance, is estimated to be $78,843. This gives a primary benefit-cost ratio for the structural measures of 1.7 to 1.0, and an overall benefit-cost ratio of 2.0 to 1.0. An analysis of these benefits and costs is shown in Table 6.

PROJECT INSTALLATION

Land treatment measures will be applied by the landowners and operators at their expense in cooperation with their respective soil and water conservation districts. The districts will make available technical assistance for the planning and application of these measures. P. L. 566 funds will be used to accelerate the assistance available from the Soil and Water Conservation District Program. This extra technical assistance will increase the rate of planning and application, including necessary soil surveys. It is planned that needed land treatment measures will be applied with the five-year installation period.

Critically eroding areas of roadbanks will be vegetated by the Dutchman Creek Watershed Improvement District in cooperation with the North Carolina State Highway Department.

Critical silt source areas in open fields will be planted to legumes and grasses by landowners on a cost-sharing basis. P. L. 566 funds will pay the cost of materials.

The North Carolina Division of Forestry, in cooperation with the U. S. Forest Service, will assign foresters to help install the forest land measures prescribed by the watershed work plan. The plan provides for 14.6 man-months of forester time for technical assistance to landowners.

This includes technical assistance for all forest land management planning -- incidental to and necessary for accomplishing the measures prescribed in the plan. The forester will schedule his work during the installation period to insure maximum benefit to the watershed project.

P. L. 566 and the North Carolina Division of Forestry will share the costs of technical assistance for land treatment measures on forest land. If the State is unable to provide funds for the first year of the program, P. L. 566 may bear the entire cost. During the rest of the installation period, the North Carolina Division of Forestry will cost share with P. L. 566 as under similar programs.

The North Carolina Division of Forestry is responsible for the technical phase of critical area tree planting under the watershed program. The plan provides one man-month of forester time for supervision of the treatment of 19 acres of critical area. Forester time for planning and supervision of fencing and site preparation is included in the one man-month. P. L. 566 funds will pay all costs of technical forestry services to accomplish critical area tree planting.

The North Carolina Division of Forestry will provide any technical forestry assistance, or other skills or overhead, in the acquisition and installation of the fire control equipment. Location and provision of an adequate tower site and supervision of the erection of the tower is part of this responsibility

The soil and water conservation districts concerned will obtain agreements to carry out recommended soil conservation measures and proper farm plans from owners of not less than 50 percent of the lands situated in the drainage area above each retention reservoir to be installed with Federal assistance.

Prior to providing financial assistance for the construction of any planned structural measures, at least 75 percent of the effective land treatment measures must be installed, or their installation commenced on those sediment source areas which, if uncontrolled, would require a material increase in the cost of construction, operation and maintenace of structural works of improvement.

Floodwater retarding structures will be installed the second, third, and fourth project years by construction units (see Table 7). Stream channel improvement and clearing and snagging will be installed the fifth project year.

The Dutchman Creek Watershed Improvement District and the owner of the land involved in the private income-producing recreation will enter into a construction agreement. This agreement will "spell out" the responsibilities of the landowner to the District, as they relate to the construction of floodwater retarding structure No. 15.

The Dutchman Creek Watershed Improvement District will be responsible for all costs in acquiring the needed land, easements and rights-of-way for structural works of improvement. The Watershed Improvement District will administer all contracts. It will also be responsible for all other costs such as organization costs, assessor fees, legal fees, and other administrative costs. The Soil Conservation Service will provide the cost for construction and installation services of floodwater retarding structures, stream channel improvement, and clearing and snagging from P. L. 566 funds.

The Dutchman Creek Watershed Improvement District has sufficient legal authority, including raising funds by levy or assessment, and the power of eminent domain, to acquire land, easements and rights-of-way needed for the project. The authority will be used as needed.

FINANCING PROJECT INSTALLATION

The Dutchman Creek Watershed Improvement District has been authorized by referendum, and has actively participated in the development of this proposed watershed work plan. The major costs of organizing have already been incurred and were locally financed. The District will classify lands benefited and will set up assessment rolls. This will permit the County Commissioners to levy assessments.

Cost-sharing assistance available under the Agricultural Conservation Program and other similar programs will be utilized in applying the land treatment measures.

The Dutchman Creek Watershed Improvement District will finance its part of the costs of the project from funds raised by assessment. Local sponsoring organizations feel that donations of land and other local assistance will enable them to finance their part of the project costs locally.

Technical assistance for the installation of forest land treatment will be provided from P. L. 566 funds and State funds on a predetermined cost-sharing basis.

Roadside erosion control will be installed by the Dutchman Creek Watershed Improvement District. The District will negotiate with the North Carolina State Highway Commission in the installation of these works of improvement.

Federal assistance for carrying out the works of improvement on non-Federal land, as described in this work plan, will be provided under authority of the Watershed Protection and Flood Prevention Act, Public Law 566 (83d Congress, 68 Stat. 666), as amended. This assistance is contingent on the appropriation of funds for this purpose.

The cost of storing water for private income-producing recreation in dam No. 15 is a non-project cost. The landowner concerned will pay the non-project costs to the Dutchman Creek Watershed Improvement District prior to issuance of invitation to bid.

PROVISIONS FOR OPERATION AND MAINTENANCE

Land Treatment

Land treatment measures for open land will be maintained by the landowners or operators of the land on which these measures are installed.

Maintenance of land treatment measures will be promoted and encouraged through the soil and water conservation districts' program with technical assistance furnished by the Soil Conservation Service.

The owners and operators of private woodlands where land treatment measures are installed under agreement with their respective soil and water conservation district will be responsible for the operation and maintenance of these measures. After accomplishment of the critical area tree planting, district supervisors will make periodic inspections of this and other forest land treatment measures to determine maintenance needs and to encourage maintenance.

The North Carolina Division of Forestry will be responsible for the operation and maintenance of cooperative fire control equipment in Davie County.

Structural Measures

The Dutchman Creek Watershed Improvement District will be responsible for the operation and maintenance of all structural works of improvement at an estimated cost of $13,500 (Table 4).

All structural measures should be inspected after every major storm and will be inspected at least once a year. Representatives of the Dutchman Creek Watershed Improvement District and the Soil Conservation Service will jointly make the required annual inspection. A report including recommendations for repairs, improvements and replacements will be prepared and filed for each inspection.

The structural works of improvement will be operated in such a manner that they will serve the purpose, both as to function and time, for which they were installed. The maintenance will consist of, but not be limited to, the following:

1. Remove and burn debris from principal and emergency spillways.
2. Refill, smooth and vegetate rilling on embankment, spillways and drainage ways.
3. Repair fences and gates.
4. Maintain good sod cover.
5. Channels will be kept free of logs, snags and debris.
6. Woody growth on banks of channels will be curtailed by spraying or removal.

Specific maintenance agreements will be entered into prior to the execution of the project agreement for works of improvement.

TABLE 1 - ESTIMATED PROJECT INSTALLATION COST

Dutchman Creek Watershed, North Carolina

Installation Cost Item	Unit	Number Non-Federal Land	Estimated Cost (Dollars)[1/] P.L. 566 Non-Federal Land	Other Non-Federal Land	Total
LAND TREATMENT					
Soil Conservation Serv.					
Cropland	Acre	5,947		184,543	184,543
Grassland	Acre	3,577		124,917	124,917
Miscellaneous Land	Acre	100		10,000	10,000
Critical Area Stab.:					
Grasses & Legumes	Acre	46	6,900	6,900	13,800
Roadside Erosion Cont.	Acre	42		16,800	16,800
Technical Assistance			129,314	32,037	161,351
SCS Subtotal			136,214	375,197	511,411
U. S. Forest Service					
Forest Land (Private)	Acre	3,871		41,750	41,750
Coop. Fire Control			8,140	9,640	17,780
Critical Area Stab.:					
Tree Planting	Acre	19	1,275	425	1,700
Technical Assistance			6,985	6,145	13,130
FS Subtotal			16,400	57,960	74,360
TOTAL LAND TREATMENT			152,614	433,157	585,771
STRUCTURAL MEASURES					
Soil Conservation Serv.					
Floodwater Retard. Str.	No.	9	457,591		457,591
Stream Channel Impr.	Feet	204,587	555,823		555,823
Clearing & Snagging	Feet	181,600	101,584		101,584
Subtotal - Const.			1,114,998		1,114,998
Installation Services					
Soil Conservation Serv.					
Engineering			227,576		227,576
Other			87,269		87,269
Subtotal - Instal. Serv.			314,845		314,845
Other Costs					
Soil Conservation Serv.					
Land, Easements & R/W				245,224	245,224
Admin. of Contracts				6,000	6,000
Subtotal - Other				251,224	251,224
TOTAL STRUCTURAL MEASURES			1,429,843	251,224	1,681,067
TOTAL PROJECT			1,582,457	684,381	2,266,838
SUMMARY					
Subtotal - SCS			1,566,057	626,421	2,192,478
Subtotal - FS			16,400	57,960	74,360
TOTAL PROJECT			1,582,457	684,381	2,266,838

1/ Price Base: 1964 Date: May 1964

TABLE 1a - STATUS OF WATERSHED WORKS OF IMPROVEMENT

Dutchman Creek Watershed, North Carolina

Measures	Unit	Applied to Date	Total Cost (Dollars)[1]
Conservation Cropping System	Acre	9,878	29,634
Contour Farming	Acre	5,758	17,274
Cover Crop	Acre	2,662	13,310
Crop Residue Use	Acre	9,280	27,840
Diversion	Feet	22,590	1,130
Drainage Main or Lateral	Feet	8,905	2,672
Ditch Bank Seeding	Feet	6,190	124
Field Border Planting	Feet	14,270	285
Grasses & Legumes in Rotation	Acre	1,715	25,725
Grassed Waterway or Outlet	Acre	190	19,000
Stripcropping	Acre	189	378
Terrace	Feet	1,179,200	47,168
Tile Drain	Feet	3,300	1,188
Wildlife Habitat Development	Acre	111	5,550
Pasture and Hayland Planting	Acre	7,337	733,700
Pasture and Hayland Renovation	Acre	2,540	152,400
Proper Pasture Use	Acre	510	5,100
Farm Pond	No.	175	175,000
Tree Planting	Acre	445	6,680
Critical Area Planting	Acre	204	29,880
Woodland Weeding	Acre	65	910
Woodland Intermediate Cutting	Acre	440	2,640
TOTAL			1,297,588

1/ Price base: 1964 Date: May 1964

TABLE 2 - ESTIMATED STRUCTURAL COST DISTRIBUTION
Dutchman Creek Watershed, North Carolina
(Dollars)1/

Structure Site Number or Name	Installation Cost - P.L. 566 Funds				Installation Cost - Other Funds					Total Installation Cost
		Instal. Services					Other			
	Construction	Engineering	Other	Total P.L. 566	Construction	Installation Services	Adm. of Contr.	Easements & R/W	Total Other	
Structure No. 2	56,035	11,767	4,407	72,209			500	10,463	10,963	83,172
5	44,336	9,311	3,487	57,134			500	6,795	7,295	64,429
6	40,850	8,578	3,213	52,641			500	8,252	8,752	61,393
7	42,817	8,992	3,368	55,177			500	12,759	13,259	68,436
8	51,757	10,869	4,071	66,697			500	24,890	25,390	92,087
10	50,221	10,546	3,950	64,717			500	20,215	20,715	85,432
12	46,684	9,804	3,672	60,160			500	30,450	30,950	91,110
15	53,339	11,201	4,195	68,735			500	13,110	13,610	82,345
					(10,817)2/	(3,123)2/		(2,569)2/	(16,599)2/	(16,599)2/
17	71,552	15,026	5,628	92,206			500	45,920	46,420	138,626
Subtotal - Structures	457,591	96,094	35,991	589,676			4,500	172,854	177,354	767,030
Stream Channel Impr.	555,823	111,165	43,354	710,342			1,000	65,100	66,100	776,442
Clearing & Snagging	101,584	20,317	7,924	129,825			500	7,270	7,770	137,595
GRAND TOTAL	1,114,998	227,576	87,269	1,429,843			6,000	245,224	251,224	1,681,067

1/ Price base: 1964
2/ Non-project costs.

Date: May 1964

TABLE 3 - STRUCTURE DATA
Floodwater Retarding Structures
Dutchman Creek Watershed, North Carolina

ITEM	UNIT	STRUCTURE NUMBERS 2	5	6	7
DRAINAGE AREA	sq.mi.	5.49	2.54	2.35	4.87
STORAGE CAPACITY					
Sediment, submerged	ac.ft.	151	54	53	110
Sediment, aerated	ac.ft.	24	10	10	21
Floodwater	ac.ft.	825	434	340	720
Recreation	ac.ft.	---	---	---	---
TOTAL	ac.ft.	1,000	498	403	851
Between high & low stages	ac.ft.	---	190	233	---
SURFACE AREA					
Sediment pool	ac.	32.0	14.0	14.0	24.0
Floodwater pool	ac.	83.0	45.0	46.0	98.0
Recreation pool	ac.	---	---	---	---
ELEVATION SEDIMENT POOL	ft.	775.5	749.0	726.0	702.5
DEPTH OF SEDIMENT POOL	ft.	9.5	10.0	9.5	12.5
VOLUME OF FILL	cu.yds.	59,768	37,020	30,093	36,982
ELEVATION TOP OF DAM	ft.	795.0	770.0	740.5	719.0
MAXIMUM HEIGHT OF DAM	ft.	33.0	35.5	29.5	34.0
EMERGENCY SPILLWAY					
Crest Elevation	ft.	791.0	765.0	737.5	716.0
Bottom Width	ft.	60.0	140.0	50.0	60.0
Type		Veg.	Veg.	Veg.	Veg.
Percent chance of use		4	2	4	4
Avg. Curve No. - Cond.II		73	73	74	74
EMERGENCY SPILLWAY HYDROGRAPH					
Storm rainfall (6-hr.)	in.	5.2	8.0	5.2	5.2
Storm runoff	in.	2.44	4.81	2.53	2.53
Velocity of flow (V_c)[1]	ft/sec	---	4.79	---	---
Discharge rate 1/	c.f.s.	---	925	---	---
Max. w.s.elev. 1/	ft.	---	767.0	---	---
FREEBOARD HYDROGRAPH					
Storm rainfall (6-hr.)	in.	8.00	14.75	8.00	8.00
Storm runoff	in.	4.81	11.09	4.93	4.93
Velocity of flow (V_c) 1/	ft/sec.	7.58	8.72	6.34	6.33
Discharge rate 1/	c.f.s.	1,380	4,360	710	835
Max. w.s. elev. 1/	ft.	795.0	770.0	740.5	719.0
PRINCIPAL SPILLWAY					
Capacity - low stage	c.f.s.	99.0	25.0	24.0	97.0
Capacity - high stage	c.f.s.	---	76.0	94.0	---
CAPACITY EQUIVALENTS					
Sediment Volume	in.	.60	.47	.50	.50
Detention Volume	in.	2.82	3.20	2.71	2.77
Spillway Storage	in.	1.23	1.93	1.21	1.31
CLASS OF STRUCTURE		A	B	A	A

1/ Maximum during passage of hydrograph Date: May 1964

TABLE 3 - STRUCTURE DATA (Continued)
Floodwater Retarding Structures
Dutchman Creek Watershed, North Carolina

ITEM	UNIT	STRUCTURE NUMBERS 8	10	12
DRAINAGE AREA	sq.mi.	7.48	5.04	8.54
STORAGE CAPACITY				
Sediment, submerged	ac.ft.	170	125	229
Sediment, aerated	ac.ft.	31	24	43
Floodwater	ac.ft.	1,229	917	1,557
Recreation	ac.ft.	---	---	---
TOTAL	ac.ft.	1,430	1,066	1,829
Between high & low stages	ac.ft.	---	---	---
SURFACE AREA				
Sediment pool	ac.	43.0	33.0	55.0
Floodwater pool	ac.	151.0	115.0	188.0
Recreation pool	ac.	---	---	---
ELEVATION SEDIMENT POOL	ft.	711.5	707.0	678.0
DEPTH OF SEDIMENT POOL	ft.	9.5	9.0	10.0
VOLUME OF FILL	cu.yds.	47,582	43,191	33,114
ELEVATION TOP OF DAM	ft.	727.5	726.0	694.0
MAXIMUM HEIGHT OF DAM	ft.	30.5	30.0	31.0
EMERGENCY SPILLWAY				
Crest Elevation	ft.	724.5	721.0	691.0
Bottom Width	ft.	60.0	220.0	40.0
Type		Veg.	Veg.	Veg.
Percent chance of use		4	2	4
Avg. Curve No. - Cond. II		74	74	75
EMERGENCY SPILLWAY HYDROGRAPH				
Storm rainfall (6-hr.)	in.	5.2	8.0	5.2
Storm runoff	in.	2.53	4.93	2.61
Velocity of flow (V_c) 1/	ft/sec.	---	4.32	---
Discharge rate 1/	c.f.s.	---	1,130	---
Max. w.s. elev. 1/	ft.	---	722.8	---
FREEBOARD HYDROGRAPH				
Storm rainfall (6-hr.)	in.	8.00	14.75	8.00
Storm runoff	in.	4.93	11.25	5.04
Velocity of flow (V_c) 1/	ft/sec	6.33	8.72	6.36
Discharge rate 1/	c.f.s.	835	6,680	585
Max. w.s. Elev. 1/	ft.	727.5	726.0	694.0
PRINCIPAL SPILLWAY				
Capacity - low stage	c.f.s.	112.0	91.0	88.0
Capacity - high stage	c.f.s.	---	---	---
CAPACITY EQUIVALENTS				
Sediment Volume	in.	.50	.54	.60
Detention Volume	in.	3.08	3.41	3.42
Spillway Storage	in.	1.23	2.48	1.45
CLASS OF STRUCTURE		A	B	A

1/ Maximum during passage of hydrograph Date: May 1964

TABLE 3 - STRUCTURE DATA (Continued)
Floodwater Retarding Structures
Dutchman Creek Watershed, North Carolina

ITEM	UNIT	STRUCTURE NUMBERS 15	17	TOTAL
DRAINAGE AREA	sq.mi.	5.72	12.87	54.90
STORAGE CAPACITY				
Sediment, submerged	ac.ft.	146	272	1,310
Sediment, aerated	ac.ft.	27	51	241
Floodwatr	ac.ft.	1,100	2,599	9,721
Recreation	ac.ft.	247	---	247
TOTAL	ac.ft.	1,520	2,922	11,519
Between high & low stages	ac.ft.	---	---	423
SURFACE AREA				
Sediment pool	ac.	44.0	62.0	321.0
Floodwater pool	ac.	159.0	228.0	1113.0
Recreation pool	ac.	90.0	----	90.0
ELEVATION SEDIMENT POOL	ft.	670.5	755.0	xxxxx
DEPTH OF SEDIMENT POOL	ft.	7.5	9.0	xxxxx
VOLUME OF FILL	cu.yds.	26,571	95,393	409,714
ELEVATION TOP OF DAM	ft.	687.5	781.0	xxxxx
MAXIMUM HEIGHT OF DAM	ft.	31.5	41.5	xxxxx
EMERGENCY SPILLWAY				
Crest Elevation	ft.	683.0	773.0	xxxxx
Bottom Wdith	ft.	260.0	220.0	xxxxx
Type		Veg.	Veg.	xxxxx
Percent chance of use		2	2	xxxxx
Avg. Curve No. - Cond. II		75	73	xxxxx
EMERGENCY SPILLWAY HYDROGRAPH				
Storm rainfall (6-hr.)	in.	8.0	7.92	xxxxx
Storm runoff	in.	5.04	4.75	xxxxx
Velocity of flow (V_c) 1/	ft/sec	3.47	4.32	xxxxx
Discharge rate 1/	c.f.s.	765	1,130	xxxxx
Max. w.s.s elev. 1/	ft.	684.2	774.8	xxxxx
FREEBOARD HYDROGRAPH				
Storm rainfall (6-hr.)	in.	14.75	14.60	xxxxx
Storm runoff	in.	11.39	10.95	xxxxx
Velocity of flow (V_c) 1/	ft/sec.	8.08	11.92	xxxxx
Discharge rate 1/	c.f.s.	6,570	15,000	xxxxx
Max. w.s.elev. 1/	ft.	687.5	781.0	xxxxx
PRINCIPAL SPILLWAY				
Capacity - low stage	c.f.s.	114.0	129.0	xxxxx
Capacity - high stage	c.f.s.	---	---	xxxxx
CAPACITY EQUIVALENTS				
Sediment Volume	in.	.57	.47	xxxxx
Detention Volume	in.	3.60	3.79	xxxxx
Spillway Storage	in.	2.85	3.12	xxxxx
CLASS OF STRUCTURE		B	B	xxxxx

1/ Maximum during passage of hydrograph Date: May 1964

TABLE 3A - STRUCTURE DATA
Channels - Enlargement

Dutchman Creek Watershed, North Carolina

Channel Designation	Sta. Numbering for Reach		Watershed Area[1]	Average "N"	Required Channel Capacity[2]	Planned Channel Capacity	Bottom Width	Side Slopes	Depth	Grade	Velocity in Channel	Volume of Excavation
	Sta. (ft.)	Sta. (ft.)	(sq.mi.)		(c.f.s.)	(c.f.s.)	(ft.)		(ft.)	(Pct.)	(ft/sec)	(cu.yds)
Dutchman Creek Main												
Dam #17 - Reach J	50+00	75+08	.37	.040	157	290	4	1½:1	6.0	.200	3.7	
Reach J - Reach I	75+08	138+00	4.92	.040	529	558	10	1½:1	6.5	.200	4.3	
Reach I - Reach H	138+00	358+48	11.80	.035	787	796	16	1½:1	7.0	.138	4.3	
Reach H - Reach G	358+48	507+50	20.68	.035	1,013	990	24	1½:1	7.0	.112	4.1	
Reach G - Reach F	507+50	705+05	27.06	.030	1,231	1,220	32	1½:1	7.0	.076	4.1	
Reach F - Reach E	705+05	768+94	38.15	.030	1,691	1,614	40	1½:1	8.0	.056	3.9	
Reach E - Reach D	768+94	874+80	41.68	.030	1,828	1,798	40	1½:1	8.5	.056	4.0	
Reach D - Reach C	874+80	952+43	45.37	.030	2,089	2,217	45	1½:1	9.0	.056	4.2	
Reach C - Reach B	952+43	1143+49	50.78	.030	2,315	2,320	45	1½:1	11.0	.030	3.4	
Reach B - Jct. Yadkin River	1143+49	1282+69	60.74	.030	2,486	2,557	55	1½:1	13.0	.014	2.6	1,070,966[3]
Cedar Creek												
Jct. Sugar Creek - Trib.#11	200+50	271+43	9.82	.035	515	502	14	1½:1	6.0	.120	3.6	
Trib. #11 - Jct. Main (Dutchman Creek)	271+43	333+54	10.58	.030	618	650	16	1½:1	8.0	.040	2.9	79,654[4]
Inlet Channels[5]		68,014					4	1½:1	6.0			196,485

1/ Uncontrolled Area
2/ Uncontrolled area plus structure release rate
3/ Total Dutchman Creek
4/ Total Cedar Creek
5/ Minor tributaries within main stream flood plain.

Date: May 1964

TABLE 3B - STRUCTURE DATA
CHANNELS - Clearing and Snagging
Dutchman Creek Watershed, North Carolina

Channel Designation	Sta. Numbering for Reach Sta. (ft.)	Sta. (ft.)	Water-shed Area (sq.mi.)	Planned Channel Capacity (c.f.s.)	Remarks
Cedar Creek	50+00	210+00	4.56	206	Clearing and Snagging
Cedar Creek	283+00	479+00	6.50	274	Clearing and Snagging
Sugar Creek	50+00	153+00	1.90	105	Clearing and Snagging
Elisah Creek	50+00	155+00	1.84	175	Clearing and Snagging
Elisah Creek	240+00	315+00	3.57	171	Clearing and Snagging
Elisah Creek Lat. #1	50+00	75+00	1.31	79	Clearing and Snagging
Buffaloe Branch	50+00	169+00	5.31	232	Clearing and Snagging
Elsworth Creek	50+00	108+00	0.28	155	Clearing and Snagging
Elsworth Creek	180+00	222+00	3.53	169	Clearing and Snagging
No Creek	50+00	172+00	4.63	207	Clearing and Snagging
Fork Creek	50+00	98+00	1.26	76	Clearing and Snagging
Bryans Branch	50+00	99+00	3.78	177	Clearing and Snagging
Smith Grove Cedar Branch	50+00	75+00	2.67	136	Clearing and Snagging
Hopkins Creek	50+00	166+00	5.61	238	Clearing and Snagging
Chinquapin Creek	50+00	118+00	3.46	166	Clearing and Snagging
Frost Mill Branch	50+00	72+00	1.50	87	Clearing and Snagging
Bull Creek	50+00	127+00	6.91	283	Clearing and Snagging
Bull Creek Lat. #1	50+00	65+00	3.48	167	Clearing and Snagging
Steelmans Creek	50+00	132+00	0.96	165	Clearing and Snagging
Dry Branch	50+00	104+00	2.49	127	Clearing and Snagging
Howards Branch	50+00	77+00	0.18	139	Clearing and Snagging
Greasy Branch	50+00	97+00	0.46	160	Clearing and Snagging
Sawmill Creek	50+00	67+00	1.40	83	Clearing and Snagging
Sawmill Creek Lat. #1	50+00	60+00	0.54	63	Clearing and Snagging
Sweet Creek	50+00	118+00	0.45	163	Clearing and Snagging
Sweet Creek	192+00	224+00	3.84	180	Clearing and Snagging
Upper Dutchman Creek	50+00	78+00	4.37	198	Clearing and Snagging
Reach F. Tributary	50+00	76+00	2.20	117	Clearing and Snagging

Date: May 1964

TABLE 4 - ANNUAL COST

Dutchmans Creek Watershed. North Carolina

(Dollars)

Evaluation Unit	Amortization of Installation Cost 1/	Operation and Maintenance Cost 2/	Total
All Structural Works of Improvement	65,343	13,500	78,843
TOTAL	65,343	13,500	78,843

1/ Price base: 1963, interest rate at 3.0 percent for 50-year amortization period.

2/ Projected prices.

Date: May 1964

TABLE 5 - ESTIMATED AVERAGE ANNUAL FLOOD DAMAGE REDUCTION BENEFITS

Dutchman Creek Watershed, North Carolina

(Dollars)[1/]

Item	Estimated Average Annual Damage		Damage Reduction Benefit
	Without Project	With Project	
Floodwater			
Crop and Pasture	41,259	6,166	35,093
Minor and Major Fixed Improvements	23,627	3,308	20,319
Subtotal	64,886	9,474	55,412
Sediment			
Infertile Deposition	1,986	278	1,708
Swamping	13,241	1,854	11,387
Reservoirs	3,575	1,275	2,300
Subtotal	18,802	3,407	15,395
Erosion			
Flood Plain Scour	1,300	182	1,118
Subtotal	1,300	182	1,118
Indirect	8,499	1,306	7,193
Total	93,487	14,369	79,118

1/ Price base: Long term projected. Date: May 1964

TABLE 6 - COMPARISON OF BENEFITS AND COSTS FOR STRUCTURAL MEASURES

Dutchman Creek Watershed, North Carolina
(Dollars)[1/]

Evaluation Unit	AVERAGE ANNUAL BENEFITS					Average Annual Cost	Benefit Cost Ratio
	Flood Prevention						
	Damage Reduction	More Intensive Land Use	Secondary	Incidental Recreation	Total		
All Structural Works of Improvement	71,081	62,382	20,509	3,600	157,572	78,843	2.0 to 1.0
GRAND TOTAL	71,081	62,382	20,509	3,600	157,572	78,843	2.0 to 1.0

1/ Price base: Benefits are long term projected and cost 1963 - (See Table 4).
2/ In addition, it is estimated that land treatment measures will provide flood damage reduction benefits of $8,037 annually.

Date: May 1964

TABLE 7 - CONSTRUCTION UNITS

Dutchmans Creek Watershed, North Carolina

(Dollars)[1/]

Measures in Construction Unit	Priority	Annual Benefits	Annual Cost
1. Floodwater Retarding Structures Nos. 17, 2	1	14,800	8,821
2. Floodwater Retarding Structures Nos. 8, 10	1	10,100	7,100
3. Floodwater Retarding Structure No. 5	2[2/]	3,200	2,604
4. Floodwater Retarding Structure No. 6	2[2/]	3,200	2,486
5. Floodwater Retarding Structure No. 7	2[2/]	3,500	2,760
6. Floodwater Retarding Structure Nos. 12, 15	3[3/]	11,500	6,943
7. Stream Channel Improvement and Clearing and Snagging	4[4/]	77,236	48,129

1/ Price base: Benefits are long term projected and cost 1963.

2/ May be built concurrently with or after installation of Structures Nos. 17 and 2.

3/ May be built concurrently with or after installation of Structures Nos. 17, 2, 8, 10 or 17, 2, 5, 6, 7.

4/ Main stem channel work can be installed after construction units 1, 3, 4, 5, and 6.

Date: May 1964

INVESTIGATIONS AND ANALYSES

Hydrologic and Hydraulic Analysis

Eighteen evaluation reaches were used in the analysis. The approximate 4,280 acres of flood plain protected by structural works of improvement were represented by 36 valley cross sections.

Rainfall amounts used in developing the historical storm series were taken from local climatological data. The entire watershed was represented by five Weather Bureau Stations, with any one gage representing a minimum of 3.3 percent and a maximum of 58.3 percent of the entire watershed. Rainfall distribution for the watershed was made by the Thiessen Weighting Method.

Soil-cover-complex runoff curve numbers were computed for each individual structure site, and for the watershed as a whole. Soil and cover conditions for five sample areas, or 25 percent of the total watershed, were mapped. Runoff curve numbers for the wooded areas were furnished by the U. S. Forest Service.

Flood routing was done by the Storage Indication Method. Weighted runoff amounts were plotted versus the routed peak discharges to obtain the discharge per unit volume of runoff. Runoff-stage relationships were then developed, and used to determine the stage produced by each storm in the historical series. Peak discharge values within a given routing reach were estimated by the concordant flow procedure. Hydrograph computations were made by the peak rate equation and storm durations were estimated from local recording gages.

Stage-discharge relationships were computed by Mannings' formula. Roughness coefficients, for use in computing rating curves, were estimated in accordance with the procedure outlined in Supplement B to Section 5 of the National Engineering Handbook. Stream channel profiles were plotted and used to determine the slope of the hydraulic grade line.

Acres inundated by depth increments and total acres inundated were computed for each of the evaluation reaches. These computations were then used to obtain the total acres inundated and depths of inundation for each of the 67 damage producing storms in the 25-year historical series.

Storage requirements for structures were computed in accordance with Engineering Memorandum NC-15, and checked against Technical Release No. 10 and Engineering Memorandum SCS-27. Emergency spillway and freeboard design hydrographs were computed in accordance with Engineering Memorandum SCS-27.

Engineering

Mean sea level, as datum, was used for all vertically controlled surveys. Horizontal controls were taken from photogrammetric maps, semi-controlled mosaics and other maps of the watershed area.

Cross section surveys of flood plain and channels were made at representative points.

Moderately detailed reservoir area topographic surveys were made on structure sites Nos. 2, 5, 15, and 17 by transit traverse of the approximate perimeter of the flood pool. Existing buildings, land use, utilities, property lines, streams and improvements were located. Sufficient contour data was obtained to plot four contour lines at critical elevations. This survey data was supplemented by profile surveys along the proposed conduit location, valley cross section at center line of dam and emergency spillway profile information.

Engineering surveys on structures Nos. 6, 7, 8, 10, and 12 were limited to the dam location area. This included a valley cross section, tube line profile and spillway data. All other engineering information for design and computations was taken from aerial photographs and topographic surveys prepared by the Corps of Engineers. These data and maps were used to plot stream profiles, develop volume-storage curves, compute volumes and derive cost estimates of the works of improvement.

Structure site selections were made from stereoscopic study of the aerial photographs of the watershed. Preliminary designs of the floodwater retarding structures were based on the design criteria as established in Engineering Memoranda SCS-27, SCS-31 (Rev.), NC-15, and Technical Release No. 2. Emergency spillway designs, depth of flow in the emergency spillway for the freeboard hydrograph and the detention volume requirements were determined by short cut methods described in the above Soil Conservation Service memoranda. Stream channels below all structures were rated using Mannings' Formula $V = \frac{1.486\ r^{2/3}\ S^{1/2}}{n}$, with the roughness coefficient "n" being derived by using as a guide, Supplement B of Section 5, National Engineering Handbook.

Floodwater retarding structures Nos. 5 and 6 were designed with two-stage inlets to protect flood plain land between the structures and the main stem channel. Single-stage principal spillways were used in the design of all other structures because of the few acres on the tributaries that would be protected and the existing large channel capacities obtainable by clearing and snagging operations.

Structures Nos. 2, 6, 7, 8, and 12 were assigned a classification of "A" because damages resulting from any failure would be confined to agricultural

lands only. Structures Nos. 5, 10, 15, and 17 were considered "B" structures due to the existance of major roads below and near and/or intense use for recreational purposes.

Economics

Land use and yield information used in the economic evaluation of this watershed was obtained from interviews with farmers who operate 50 percent of the crop and pasture land in the watershed. Basic data pertaining to the watershed was obtained from local farmers, farm machinery dealers, agricultural workers, experiment stations, and Department of Agriculture publications.

Damageable values, stage-area relationships, flood series, and depth and duration of inundation were considered in estimating average annual damages with and without the project. Value of land, easements and rights-of-way involved in structural works of improvement was determined by the sponsoring local organizations and concurred in by the Service. Estimates of production cost, operation and maintenance cost, and benefits are based on long term projected prices with calculations based on the use of a three percent interest rate and a 50-year evaluation period.

Estimates of more intensive use benefits were based on indicated intentions of the flood plain landowners. Calculations were as follows:

SUMMARY OF RESTORATION AND MORE INTENSIVE USE OF LAND

Dutchmans Creek Watershed, North Carolina
(Dollars)[1/]

Land Use	Without Project Conditions				With Project Conditions			
	Acres	Weighted Average Yield	Gross Value	Net Returns	Acres	Weighted Average Yield	Gross Value	Net Returns
Corn	314	70 bu.	31,871	17,560	522	70 bu.	52,983	29,228
Corn Silage	143	21 T	34,985	24,832	433	24 T	121,067	86,698
Soybeans	57	25 bu.	31,493	1,139	57	30 bu.	37,791	1,597
Oats & Lespedeza	17	40 bu	1,359	331	16	50 bu.	13,346	354
Wheat & Lespedeza	17	25 bu.	1,411	315	15	30 bu.	13,179	354
Tobacco	4	2,300 lbs.	4,140	1,560	17	2,300 lbs.	17,595	1,560[2/]
Improved Pasture	1,427	6 AUM	50,662	11,477	1,325	8 AUM	62,256	22,518
Idle & Brush	456				50			
TOTAL	2,435		155,921	57,214	2,435		318,217	142,309

1/ Long term projected prices.

2/ $5,070 ($290 x 13 acres) subtracted for shift of allotted crop from upland.

3/ Consists of restoration of 406 acres to former productivity for a benefit of $12,450 and a more intensive land use benefit of $62,382.

Increased net returns	$85,095
Less annual associated cost	1,624
Average annual benefit	$83,471
Estimate 50% of benefits will accrue immediately with project	$ 41,736
Estimate 50% of benefits discounted 10 yrs. @ 5% (41,736 x .793)	33,096
Discounted average annual benefit	$ 74,832 [3/]

Date: May 1964

Methods and procedures contained in the Economics Guide for Watershed Protection and Flood Prevention were followed in the calculation of estimated floodwater damages to crops and pasture, and major and minor fixed improvements. Such procedures were also followed in arriving at estimates of benefits.

Geologic investigation reveals that the project will reduce sediment delivery to High Rock Lake by 92 acre-feet annually. Land treatment is credited with 64 acre-feet, structural measures are credited with 28 acre-feet. Storage is valued at $25 per acre-foot. Annual benefits accruing to land treatment will be $4,094 and to structural measures, $784.

Local secondary benefits were recognized and computed as follows:

SECONDARY BENEFITS

Estimates of Secondary Benefits	Amounts	Secondary Benefits
Direct Primary Benefits	$126,270 x 10%	$12,627
Added Crop and Pasture Cost	77,201 x 10%	7,720
Annual Associated Cost	1,624 x 10%	162
		$20,509

Private Income-Producing Recreation

Floodwater retarding structure No. 15 was designed to include additional water for private income-producing recreation. The cost of this additional storage is considered a non-project cost and is not included in Tables 1 or 2. Costs were allocated in accordance with the "Use of Facilities Method." The following table was prepared to show procedure used in the cost allocation:

ESTIMATED COST ALLOCATION
Floodwater Retarding Structure No 15
(With Added Non-Project Cost Income-Producing Recreation)

Item	Flood Pre-vention	Recreation (Non-Project Cost)	Total
1. Sediment (ac/ft)	173	0	173
2. Water Storage Capacity (ac)	1,045	247	1,292
3. Total Capacity (ac/ft)	1,218	247	1,465
4. Percent Total Capacity	83.14	16.86	100
5. Construction Cost (Dollars)	53,339	10,817	64,156
6. Engineering Services (Dollars)	11,201	2,272	13,473
7. Other (Dollars)	4,195	851	5,046
8. Easements & R/W (Dollars)	13,110	2,659	15,769
9. Admin. of Contracts (Dollars)	500	0	500
10. Total Allocated Cost (Dollars)	82,345	16,599	98,944

Incidental recreation benefits from the use of the project works of improvement by organized groups and the general public were computed in accordance with procedures outlined in Watershed Memorandum SCS-57, dated October 3, 1962.

Field surveys were made to determine existing facilities and the expected number of visitor-days of annual use. Landowners involved were interviewed to ascertain area to be set aside for recreational use, planned facilities, and maintenance policies. Population and population trends were computed within a 50-mile zone of influence.

Accessibility, available service facilities, recreational capacity, and admission levels were considered in arriving at the number of visitor-days to use. Field surveys reveal that limited basic facilities such as access roads, parking areas, picnic areas, and fishing and swimming areas are planned at each site. One site will have fully developed recreation facilities.

With planned facilities and proper maintenance, 3,600 visitor-days is considered a conservative estimate. These 3,600 visitor-days will yield an annual net incidental recreation benefit of $3,600 after all costs, including non-project associated cost, are deducted.

Soils

The principal soils of the watershed were found to be Cecil, Lloyd, Enon, Iredell, Mecklenburg, and Appling. These soils are developed from a variety of rocks. The upper reaches are predominantly from weathered diorite and

gabbro while the lower areas are hornblende gneiss and granite.

The outstanding soil features of the watershed are:

(1) The Iredell, Mecklenburg, and Enon soils occur on the smooth topography around Farmington. These soils have fine textured surfaces and heavy sticky to plastic subsoils that are slowly permeable.

(2) The area south and west of Farmington and north of Mocksville has rough broken topography and the soils are predominately Wilkes, Enon, Mecklenburg, and Lloyd with some Cecil. They have fine sandy loam to clay loam surfaces and moderately deep to shallow subsoils. Erosion has left considerable areas with clay loam surfaces which have slow infiltration rates. The subsoils are moderately to slowly permeable.

(3) The areas of Cecil, Appling, and Wilkes soils are along the southern portion of the watershed. The surface soils are sandy loams to fine sandy loams over friable to firm reddish subsoils. These soils are moderately deep and the infiltration is moderate except on the eroded areas. Permeability of the subsoil is moderate.

Sediment

Determination of sediment damages was accomplished by field examination of several samples comprising about 50 percent of the flood plain area, and expanding the data thus obtained to the flood plain total area.

Rates of soil movement and sediment production were determined by using Musgrave's Formula which takes into account soil decline, percent of slope, length of slope, rainfall, and cover conditions. Soils and percent of slope data were obtained from weighed acreage measurement of soil surveys of the watershed. Length of slope was determined by stereoscopic studies of aerial photographs. Land cover data was obtained by making a detailed cover survey of appropriate sample areas of the flood plain. Rates were determined for each land resource area and for each land use respectively. Cover factors used in the determination of future rates of soil movement were computed from anticipated use of the land in the future.

Rates of soil movement and sediment production from channel type of erosion were determined by delineating critical areas and roadbanks on aerial photographs and then determining the annual rate of cutting. Total sediment damage was determined in each case for the reach under consideration in terms of area contributing to that reach. Streambank erosion and gully erosion are not serious problems in this watershed.

Sediment storage was computed for each floodwater retarding structure separately. An analysis was made of the cover complex, sheet erosion, and channel erosion on the watershed area controlled by each individual structure. The total soil movement was determined, and appropriate delivery ratios were applied to calculate sediment storage requirements.

Total soil movement was computed for the entire watershed and appropriate delivery rates were applied to determine sediment delivery at the lower end of the watershed. The effects of planned land treatment and structural works of improvement were taken into account in computing the future sediment delivered at the lower end of the project. Since High Rock Lake is located only ten miles downstream on the Yadkin River, it is estimated that at least 95 percent of the sediment delivered from Dutchman Creek into the Yadkin River is delivered to High Rock Lake. A visual inspection of the Yadkin channel showed no channel fill in this reach.

Geology

Geologic investigations consisted of a study of surface features to determine jointing or faulting or other structural geologic conditions which would affect the design or operation of the proposed installations.

Outcrops of hard rock were abundant and were used in the investigations. Road cuts were examined. Hand augers were used to study overlying material and depth of bedrock in borrow, structure sites, and in the stream channels. The information thus obtained was utilized in developing preliminary structural designs.

The area is interrupted by four major structures that generally trend in a northeast direction. The dominant or most pronounced structure that occupies the greater center portion of the watershed is a massive igneous intrusion of gabbro and diorite that has been dissected by frequent basalt dikes. These dikes have tended to prevent valley degradation and to decrease channel gradient. On numerous occasions the dikes entered into the flood plain and have caused meandering. Although the depth of weathering is relatively shallow in this area, the topography is very smooth and gentle for this section of the Piedmont.

Two geologic structures are located in the western part of the watershed. One structure is composed of mica gneiss interbedded with mica schist. Here weathering has extended to depths of 40 feet or more. Slopes are steeper and stream gradients are greater. The second structure in the western part of the watershed is underlain by shales and siltstones of the Triassic age. Numerous good structure sites are available in the mica gneiss and Triassic areas.

The eastern part of the watershed composes the fourth structure, which is underlain by granite that is massive to weakly foliated and even-grained to porphyritic in texture. Two large areas of granite are completely enclosed by the gabbro-diorite rocks.

Fish and Wildlife

The River Basin Study Section of the U. S. Fish and Wildlife Service, in cooperation with the North Carolina Wildlife Resources Commission and the Soil Conservation Service, has made a reconnaissance study of the Dutchman Creek Watershed.

It was concluded that this stream has a valuable fishery and is also used consistantly by summer and winter populations of ducks.

It was also concluded that to obtain the desired level of flood prevention, the fishery would be damaged by removal of necessary cover, deep holes, and undercut banks.

Duck populations will be damaged by removal of food and den trees, necessary protective cover, and the reduction of flooding.

Land Treatment

The land treatment measures planned were developed by the sponsoring local organizations with the assistance of the Soil Conservation Service and the U. S. Forest Service.

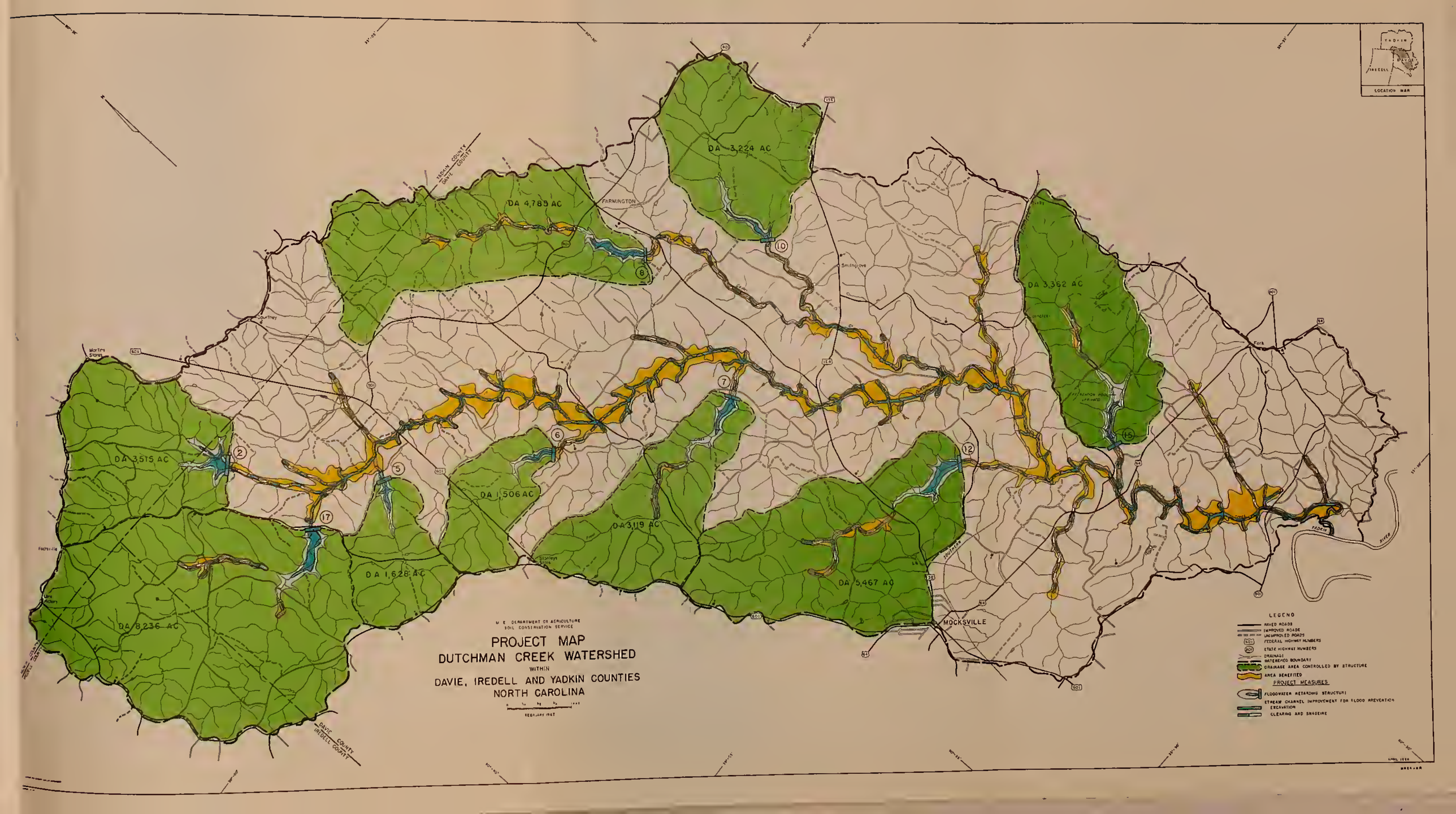
Basic data available included records of conservation treatment by landowners in the watershed and land use adjustment trends as indicated by the conservation needs inventory. Soil and water conservation districts' records and plans were available and used in determining the acres to be treated and measures to be applied.

Forestry

A systematic field survey showed ground cover, forest and hydrologic conditions, and treatment needs. This survey, supporting data and information from other agencies and forestry officials determined the amount of remedial measures. The measures recommended contribute directly to flood reduction and soil stabilization. The installation period limits the amount of work in the recommended programs.

CONSTRUCTION

Heights of dams will vary from about 25 to 50 feet. Foundations, in the areas underlain by the gabbro-diorite and by the granite, will be practically non-yielding for these low structures. Structures in the Triassic area and in mica gneiss areas will have yielding foundations. Abutment slopes at all sites are fairly gentle, and leakage through the abutment is not expected at any site. Plenty of good borrow material is available at all the sites located in the Triassic, mica gneiss, and granite areas. Depth of borrow material is shallow at the sites located on the gabbro, and use of this material will depend on laboratory tests. Depth of cuts in the emergency spillways will be shallow at most of the sites; however, due to the shallow zone of weathering in the gabbro area some rock excavation can be expected. Very little, if any, rock excavation is expected in the construction of channels. Care will have to be exercised in the channel layout to avoid the basalt dikes that cut into the flood plain at several locations.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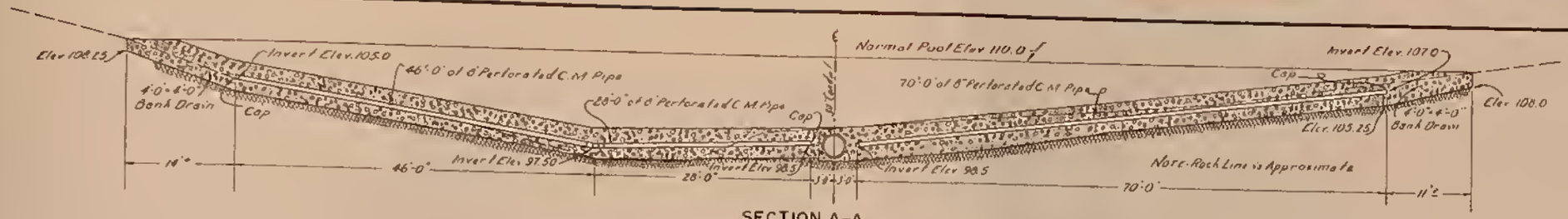
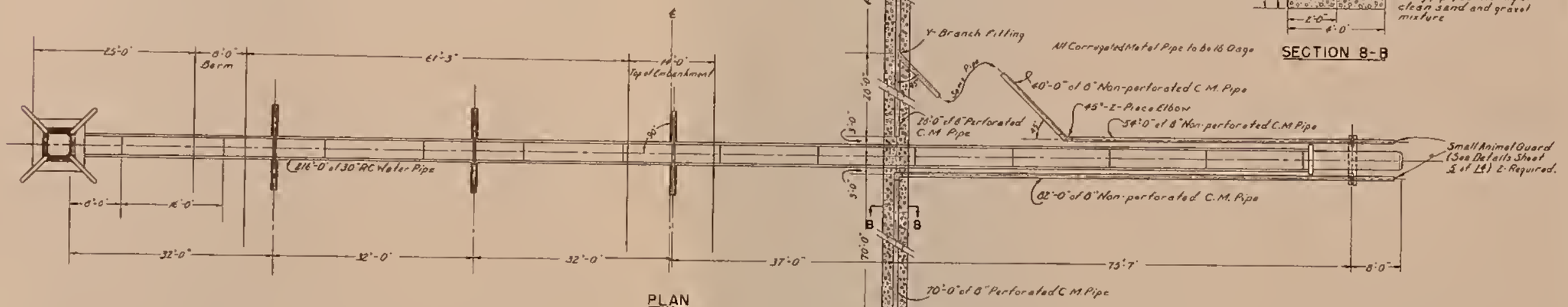
DA 1,628 AC
DA 5,467 AC
DA 8,236 AC
FARMINGTON
MOCKSVILLE
YADKIN COUNTY
DAVIE COUNTY
DAVIE COUNTY
IREDELL COUNTY
LOCATION MAP
U S DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
PROJECT MAP
DUTCHMAN CREEK WATERSHED
WITHIN
DAVIE, IREDELL AND YADKIN COUNTIES
NORTH CAROLINA
FEBRUARY 1967
LEGEND
PAVED ROADS
IMPROVED ROADS
UNIMPROVED ROADS
FEDERAL HIGHWAY NUMBERS
STATE HIGHWAY NUMBERS
DRAINAGE WATERSHED BOUNDARY
DRAINAGE AREA CONTROLLED BY STRUCTURE
AREA BENEFITED
PROJECT MEASURES
FLOODWATER RETARDING STRUCTURE
STREAM CHANNEL IMPROVEMENT FOR FLOOD PREVENTION
EXCAVATION
CLEARING AND SNAGGING

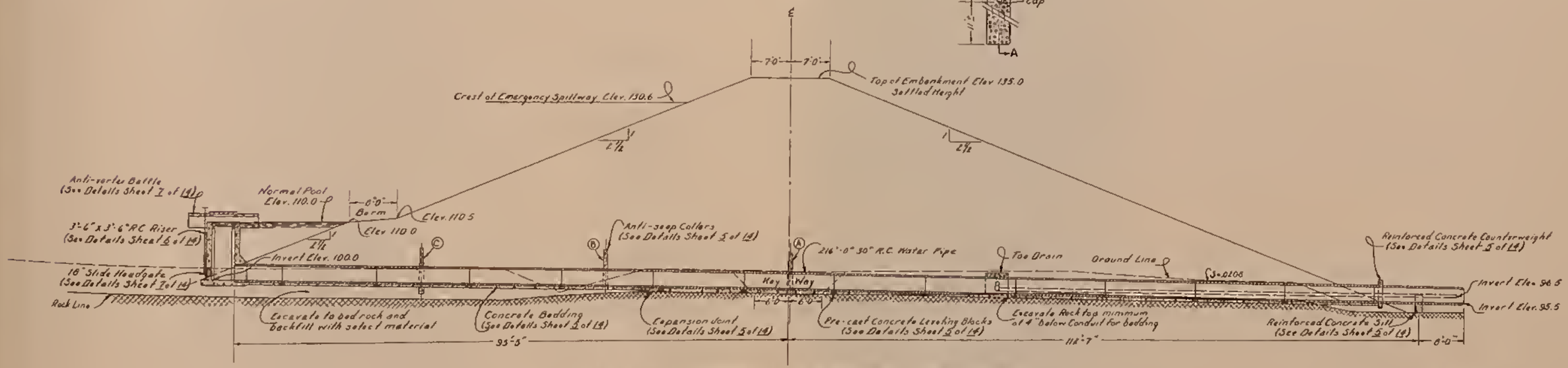


SECTION A-A
ELEVATION ALONG CENTERLINE OF 8" PERFORATED C.M. PIPE



PLAN

SECTION B-B



SECTION ALONG CENTERLINE OF 30" REINFORCED CONCRETE PIPE
STA. 4+33 CENTERLINE OF DAM

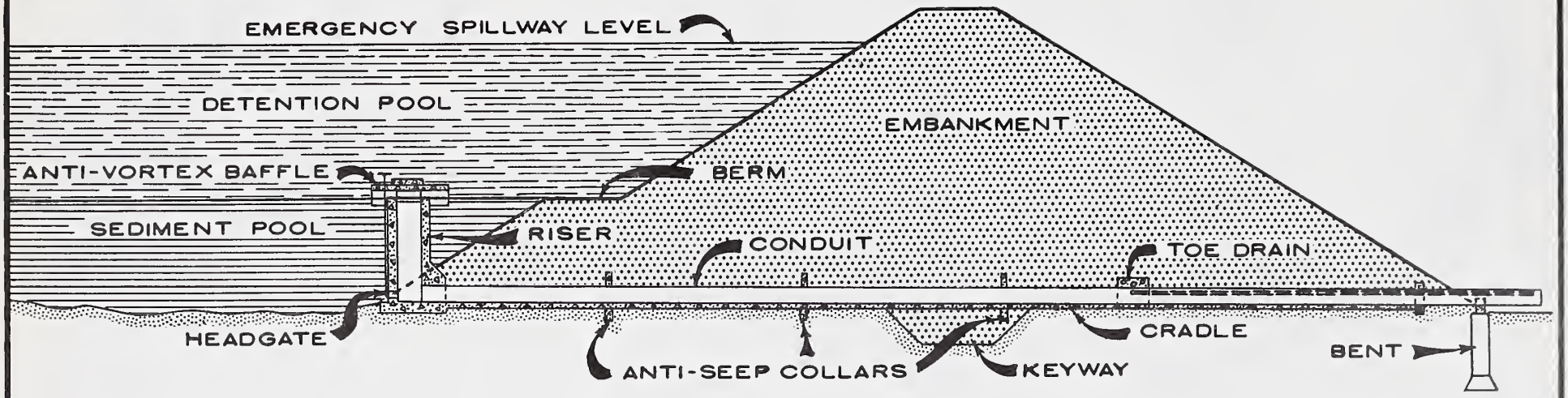
PLAN
TYPICAL FLOODWATER RETARDING STRUCTURE

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

Designed — Date
Drawn
Traced
Checked
Approved by
Title
Title
Sheet No. of
Drawing No.

UNITED STATES
DEPARTMENT OF AGRICULTURE

SOIL CONSERVATION SERVICE
SPARTANBURG, SOUTH CAROLINA



SECTION OF A TYPICAL
FLOODWATER RETARDING STRUCTURE

AGR. SCS-SPARTANBURG, S.C. 1956 REPRINTED 1960

MR56-209